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## Formal Mitigation Plan

### DOE RUN SLAG STORAGE AREA - OFF-SITE MITIGATION FESTUS, MISSOURI

June 2006

Site:	<i>Washburn, Mo.</i>
ID #	<i>MD-0062602</i>
Break:	<i>2.0</i>
Other:	<i>6/2006</i>
<i>A77 gmm</i>	

Prepared for:  
THE DOE RUN COMPANY

SCI No. 2004-2077.31

40246603



SUPERFUND RECORDS



**SCI ENGINEERING, INC.**

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SUPERFUND DIVISION

CONSULTANTS IN DEVELOPMENT,  
DESIGN, AND CONSTRUCTION  
GEOTECHNICAL  
ENVIRONMENTAL  
CULTURAL RESOURCES  
NATURAL RESOURCES  
CONSTRUCTION SERVICES

Mr. Bruce Morrison  
U.S. Environmental Protection Agency  
Superfund Division  
901 North 5<sup>th</sup> Street  
Kansas City, Kansas 66101

Re: Formal Mitigation Plan  
Doe Run Slag Storage Area – Off – Site Mitigation  
Festus, Missouri  
SCI No. 2004-2077.31

Dear Mr. Morrison:

On behalf of the Doe Run Company (Doe Run), SCI Engineering, Inc. (SCI) is submitting the fourth revised mitigation plan, which seeks approval for mitigation proposed at an off-site location near Festus, Missouri. The report includes a wetland impact assessment associated with the slag storage facility proposed at Doe Run's Herculaneum Smelter, in addition to the mitigation plan. Total proposed impacts for the slag storage facility consist of 8.6 acres. Overall, the created wetland design has not been significantly changed since the March 2006 submittal. The plan has incorporated suggestions provided by all commenting agencies. It outlines procedures to create approximately 12.45 acres of emergent wetland habitat, 6.83 acres of scrub-shrub wetland habitat, restore approximately 3.36 acres of Joachim Creek's riparian corridor, and preserve approximately 3.74 acres of Joachim Creek's bankline. A total of 27.80 acres is proposed to be deed restricted in perpetuity with Jefferson County.

Doe Run has minimized proposed impacts associated with the slag storage area, provided mitigation within the Joachim Creek Watershed, applied appropriate mitigation ratios, and have incorporated suggestions and requests provided by all commenting agencies. Based on these factors, Doe Run and SCI request approval of the following mitigation plan.

ST. CHARLES, MISSOURI  
FAIRVIEW HEIGHTS, ILLINOIS  
ST. LOUIS, MISSOURI  
UNION, MISSOURI

Mr. Bruce Morrison  
U.S. Environmental Protection Agency

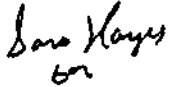
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June 29, 2006  
SCI No. 2004-2077.31

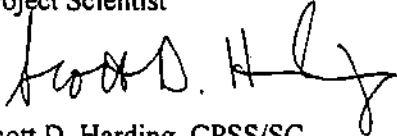
Please call if you have any questions or need additional information.

Respectfully,

**SCI ENGINEERING, INC.**



Laurie M. Farmer  
Project Scientist



Scott D. Harding, CPSS/SC  
Vice President

LMF/SDH/mab

Enclosure

C: Mr. Robert Hinkson, Missouri Department of Natural Resources  
Mr. Ward Lenz, U.S. Army Corps of Engineers  
Mr. Aaron Miller, The Doe Run Company (5)

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**Formal Mitigation Plan**  
**DOE RUN SLAG STORAGE AREA –**  
**OFF-SITE MITIGATION**  
**FESTUS, MISSOURI**

**1.0 INTRODUCTION**

On behalf of the Doe Run Company (Doe Run), SCI Engineering, Inc. (SCI) has prepared a formal mitigation plan, outlining a proposal to offset wetland impacts associated with the slag storage facility at the Doe Run Smelter in Herculaneum, Missouri. The Doe Run slag storage facility and mitigation efforts are under the direction of an Administrative Order on Consent entered into by the U.S. Environmental Protection Agency (USEPA), Missouri Department of Natural Resources Hazardous Waste Program (HWP), and Doe Run. The USEPA and HWP have requested the technical assistance of the U.S. Army Corps of Engineers (CE) and the Missouri Department of Natural Resources – Water Pollution Control Program (WPCP) to make certain that mitigation is processed in accordance to standard protocol associated with the CE's Section 404 program and WPCP's 401 Water Quality Certification. The following report is the fourth mitigation plan submitted by SCI to the USEPA and HWP, seeking approval for an off-site mitigation area located in Festus, Missouri (Figure 3).

The following mitigation plan incorporates verbal and written comments provided by all agencies generated from our previous submittals, dated November 4, 2004, March 22, 2005, and March 16, 2006. Doe Run has worked to reduce proposed wetland impacts at the Herculaneum Smelter, as well as provide an appropriate amount of mitigation at the site located in Festus, Missouri. Due to the reduction of impacts, Doe Run has received guidance provided by the Missouri Department of Natural Resources (MDNR), indicating that acceptable mitigation for this project may now consist of 27.80 acres. In total, proposed mitigation will consist of approximately 6.83 acres of created scrub-shrub wetland habitat, 12.45 acres of created emergent wetland habitat, 3.36 acres of restored riparian corridor, and 3.74 acres of preserved riparian corridor. The above-referenced 27.80 acre mitigation area exists north of an on-site AT&T easement. The following mitigation plan will discuss only areas existing north of the AT&T easement. A total of 27.80 acres is proposed to be deed restricted by Doe Run within the property.

**2.0 MITIGATION PLAN OVERVIEW**

The proposed wetland mitigation site is located in Festus, Missouri and adjacent to Joachim Creek (see Figure 3). This site is located approximately 11 river miles upstream of the site of impacts in Herculaneum, Missouri. SCI has received positive feedback from the USEPA, HWP, and the CE regarding its potential to become a viable mitigation site. Due to the positive feedback, Doe Run

purchased the property in February 2005. Additionally, the CE has preliminarily indicated the site can likely be transformed into a wetland based upon SCI's verbal description of the site conditions.

When preparing the following mitigation plan, ratios were considered to provide a plan that adequately compensates for proposed impacts associated with the slag storage facility. Proposed impacts now consist of approximately 8.6 acres to emergent wetland habitat and scrub-shrub wetland habitat. The following is a breakdown of applied mitigation ratios. The USEPA has indicated that a credit would be given at a 4:1 mitigation ratio to riparian buffer planting and preservation. SCI has identified that approximately 7.1 acres of riparian restoration (3.36 acres) and preservation (3.74 acres) can be provided by Doe Run. At a 4:1 mitigation credit ratio, riparian restoration and preservation should yield approximately 1.78 acres, thus reducing impact acreage to approximately 6.82 acres ( $8.6 \text{ acres} - 1.78 \text{ acres} = 6.82 \text{ acres}$ ). The following mitigation plan proposes approximately 19.28 acres of created emergent and scrub-shrub wetlands, which equates to a ratio at approximately 2.83 acres mitigation to 1 acre of impact ( $19.28 \text{ acres} \div 6.82 \text{ acres} = 2.83 \text{ acres}$ ). A total of 27.80 acres of wetland, riparian corridor, and non-wetland habitat is proposed to be deed restricted within the Joachim Creek watershed.

SCI and Doe Run have adhered to the requests made by commenting agencies. We anticipate the formal mitigation plan offers adequate compensatory mitigation through applying appropriate mitigation ratios. The following sections describe the proposed mitigation site's details and methods by which Doe Run will create wetlands to compensate for unavoidable losses to State and Federal waters.

### **3.0 MITIGATION SITE OVERVIEW**

In 2004, SCI and Doe Run identified property within the floodplain of Joachim Creek, in Festus, Missouri (Figure 3) as a viable mitigation option. The U.S. Geological Survey (USGS) topographic map quadrangle and the National Wetlands Inventory (NWI) map were reviewed for background information concerning the site. The USGS map depicted a gently sloping landscape, shedding water in a northerly direction. The NWI map did not identify any potential wetlands. The USGS map and NWI map are enclosed as Figures 3 and 4, respectively.

SCI performed a site visit in October of 2004 to document the existing or "baseline" conditions of the proposed mitigation area. The property consisted of a gentle- to moderately-sloping landscape, draining in a northwesterly direction. The mitigation site was relatively flat, with the exception of a hill, approximately 10 feet high, located near the southeastern corner of the property. This elevation change, as well as potential cultural resource concerns, excludes the southeastern corner of the property from

becoming functional mitigation acreage. The property's land use in 2004 consisted of agriculture under soybean production. However, the property was allowed to go fallow during the growing season of 2005. The Jefferson County Natural Resources Conservation Service has mapped the proposed wetland mitigation site as Horsecreek silt loam within the higher elevations, while the lower elevations were mapped as Kaintuck fine sandy loam.

Soil borings up to 60 inches were advanced in the proposed mitigation site (Figure 5). SCI did not exhibit evidence of existing regulated wetland conditions. The soil texture varies throughout the site with the predominant texture consisting of fine sandy loam. Other soil textures include clay loam and silt loam with fine sandy loam intermixed. The soils were already exhibiting matrixes of 10 YR 4/2. Within some soil boring locations, SCI observed evidence of mottling within the top 12 inches. Based on these observations, SCI estimates that the seasonal high water table is located approximately 10 to 24 inches deep. The soil on the site appears to exhibit a high enough permeability to allow for relatively unrestricted exchange between the constructed wetland and subsurface groundwater fluctuations. No coarse sand lenses were encountered in any of our soil borings within the proposed constructed wetland area. Sand lenses within the soil stratum can prevent the accumulation of water within a constructed wetland, often leading to its failure to meet performance standards. A summary of the site's soil conditions have been provided in Table 3.1.

**Table 3.1 – Existing Soil Conditions**

Soil Boring	Depth (inches)	Soil Matrix	Mottles	Texture
1	0 – 32	10 YR 4/4	---	cl
	33 – 60	7.5 YR 4/4	---	fsl, sil
2	0 – 10	10 YR 4/3	---	sil
	11 – 60	10 YR 4/2	10 YR 2/1 10 YR 4/6	sil
3	0 – 36	10 YR 4/2	---	fsl, sil
	37 – 60	10 YR 4/3	10 YR 6/3	fsl, sil
4	0 – 9	10 YR 4/2	---	sil
	10 – 36	10 YR 4/2	faint 10 YR 2/1	fsl
	37 – 60	10 YR 4/2	Common 10 YR 6/3	fsl

The existing riparian corridor at the proposed mitigation site consists of a thin to single-tree lined streambank. Along the northern edge of the property, the riparian corridor consists of single tree line to even just a few scattered trees. The trees present are mostly mature silver maples (*Acer saccharinum*)

with few scattered osage oranges (*Maclura pomifera*). Along the western property boundary, the riparian corridor consists of a very narrow riparian corridor, measuring approximately 20 to 30 feet in width. Species along the western property boundary consist of silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), red buckeye (*Aesculus pavia*), and American sycamore (*Platanus occidentalis*). Streambanks along the western property boundary consist of near vertical banks, measuring approximately 13 to 16 feet tall. Evidence of Ordinary High Water Marks, consisting of rafted debris and vegetation patterns suggesting high stream flow, were observed. Along the northern property boundary, the banks range from approximately 7 to 10 feet tall with Joachim Creek containing sandbars downslope of the bank's edge.

#### **4.0 MITIGATION DESIGN**

The CE typically requires several standard criteria before a constructed wetland can be accepted as a mitigation site. Ultimately, the wetland must display characteristics of a regulated wetland as outlined in the CE's 1987 wetland Delineation Manual. The hydrology of the wetland area must be sufficient to support a predominance of hydrophytic vegetation as well as promote the development of hydric soils characteristics. The recruitment of hydrophytic vegetation and establishment of hydric soils is directly linked to the creation of wetland hydrology. Therefore, Doe Run will focus on constructing a wetland that mimics natural wetland hydrology in order to meet the typical requirements of the CE. Based on the above description of the existing soils conditions (which were close to already displaying hydric soil characteristics), it is anticipated that hydric soils characteristics should develop easily with minor manipulation.

#### **4.1 Hydrology**

Hydrology is often the most difficult component of a constructed wetland to achieve. This proposed mitigation site has two potential sources for hydrology, making it a viable site for wetland construction. The two sources of hydrology include excavation to intercept the seasonal high water table and overland flow from the surrounding watershed. The constructed wetlands, which will be excavated deeper to provide a 12.45-acre emergent wetland habitat, as well as a 6.83-acre scrub-shrub wetland, are proposed to exist north of an AT&T berm.

##### **4.1.1 Excavation to Seasonal High Water Table**

The primary source of hydrology to the created wetlands will be derived from fluctuations of the seasonal high water table. The extent of excavation recommended is based on the existing elevation of the landscape and the depth to the seasonal high water table. Within the subject site, SCI observed evidence



of mottling within 10 to 24 inches of extracted soil profiles, thus suggesting appropriate cuts should measure approximately 2 feet to intercept the estimated seasonal high water table. Based on these observable features, final constructed grades are proposed to measure approximately el. 403.0 within areas of the emergent wetlands and el. 404 within areas of the scrub-shrub wetlands (see Conceptual Cross-Section – Figure 7). The elevation of the scrub-shrub wetland is proposed at a higher elevation than the emergent to promote greater survivability of desired vegetation. The bottom of both wetland habitats should be graded to contain a rolling or undulating finished grade that varies from 6 to 18 inches overall. However, the average grade should be within the targeted elevation. The undulating bottom is necessary to more closely match the grades of natural wetlands, and will serve to establish microhabitats that will increase the overall diversity of the constructed wetland.

Side slopes descending from Joachim Creek side will consist of slopes no steeper than 6 horizontal to 1 vertical (6H:1V). A setback of approximately 75 feet from the Joachim Creek will be established as an area of no excavation and riparian enhancement (see Figures 6 and 7). Additionally, a 50-foot setback along the Union Pacific railroad easement has been included to allow access to the mitigation areas and Joachim Creek. Both the 50-foot and 75-foot will contain a 15-foot wide dirt path to allow site maintenance and monitoring.

Silt control devices, such as silt fences must also be placed near Joachim Creek to protect against sedimentation during grading activities. Any site(s) utilized for placement of the excavated material shall comply with all Federal, State, and local agencies. Material placed within the 100-year flood plain shall require approval by the appropriate authorities.

#### **4.1.2 Overland Flow**

Overland flow of surface stormwater will help contribute to the created wetlands' hydrology. Unfortunately, the amount of watershed acreage contributing to the created wetland exists only within the confines of the property boundary. Areas east of the property have been severed by an existing Union Pacific railroad easement. As previously indicated, property located south of the AT&T easement contains a slight hill that sheds water in the north and west direction. Water flowing to the north is expected to direct additional water to the wetlands.

#### **4.2 Vegetation**

Hydrophytic vegetation is defined as species that are best suited or specially adapted to life under moist or saturated soil conditions that result in a substrate that is at least periodically deficient in oxygen.

Hydrophytic species are characterized as having an indicator status of facultative or wetter (OBL, FACW, or FAC, excluding FAC-). Upon establishment, the vegetation growing in the wetlands should be composed of more than 50 percent hydrophytic species. The relative cover of hydrophytic species within the wetlands should total at least 75 percent. Relative cover should be interpreted as the cover of all hydrophytic species as a percent of the total plant cover. Doe Run will attempt to construct the wetlands in order to maintain 75 percent hydrophytic coverage and composition. See Section 7.1 for more detailed description on Performance Criteria.

#### **4.3 Seeding and Mulching for Stabilization**

Seeding with a nurse crop and mulching shall be performed on all graded side slopes. The nurse crop mix used shall be composed of quick growing, annual species such as oats or annual rye grass. The nurse crop will reduce the potential for erosion and sedimentation on the site.

#### **4.4 Emergent**

It is likely that the on-site soil does not contain a seedbank sufficient to naturally revegetate the newly-graded areas with herbaceous cover given the past agricultural history. Therefore, a seed mix containing species suited for mesic to saturated soil conditions is recommended for the 12.45 acres of proposed emergent wetland.

Additionally, per the recommendation of the USEPA and the HWP, soil from the top 6 inches of excavated material will be stockpiled to provide an additional seedbank source, as well as provide soil rich in organic matter content. This soil will be utilized to reline the area following completion of grading activities. Listed in Table 4.1 are species that are suited to wetland conditions, and may be included within the seed mix. Fall or spring seeding should result in the highest probability for successful wetland plant establishment.

**Table 4.1 – Herbaceous Wetland Species**

Common Name	Scientific Name	Indicator Status
Sweet Flag	<i>Acorus calamus</i>	OBL
Swamp Milkweed	<i>Asclepias incarnata</i>	OBL
Panicled Aster	<i>Aster simplex</i>	FACW
Tickseed – Sunflower	<i>Bidens coronata</i>	OBL
Sweet Joe Pye Weed	<i>Eupatorium purpureus</i>	FAC
Northern Bedstraw	<i>Galium boreale</i>	FAC
White Avens	<i>Geum canadense</i>	FAC
Sneezeweed	<i>Helenium autumnale</i>	FACW+
Spotted Touch-Me-Not	<i>Impatiens capensis</i>	FACW
Blue Flag Iris	<i>Iris virginica shrevei</i>	OBL
Great Blue Lobelia	<i>Lobelia siphilitica</i>	FACW+
Bunch Flower	<i>Melanthium virginicum</i>	FACW+
Monkey Flower	<i>Mimulus ringens</i>	OBL
Ditch Stonecrop	<i>Penthorum sedoides</i>	OBL
Bristly Buttercup	<i>Ranunculus hispidus</i>	FAC
Curly Dock	<i>Rumex crispus</i>	FAC+
Slender Wheat Grass	<i>Agropyron trachycauluna</i>	FAC
Bearded Beggar Ticks	<i>Bidens gristosa</i>	FACW
Fringed Sedge	<i>Carex crinita</i>	OBL
Fox Sedge	<i>Carex vulpinoidea</i>	OBL
Virginia Wild Rye	<i>Elymus virginicus</i>	FACW-
Fowl Manna Grass	<i>Glyceria striata</i>	OBL
Rice Cut Grass	<i>Leersia oryzoides</i>	OBL
Dark-green Bulrush	<i>Scirpus atrovirens</i>	OBL
Cord Grass	<i>Spartina pectinata</i>	FACW+
Bur-Reed Sedge	<i>Carex sparganioides</i>	FAC
Wool Grass	<i>Scirpus cyperinus</i>	OBL
Softstem Bulrush	<i>Scirpus validus</i>	OBL

#### 4.5 Scrub-Shrub

Within the proposed 6.83-acre scrub-shrub wetlands, Doe Run has the opportunity to diversify the vegetation of the constructed wetlands in comparison to the monotypic plant species within the wetland to be impacted. Doe Run will plant established shrubs within the designated scrub-shrub wetland habitat. The plants to be installed will consist of 2- to 3-gallon containerized advanced root system varieties, which have been proven to produce faster growing plants with high survival rates. Shrubs will be

installed with tree guards and weed mats to reduce vegetative competition and animal browsing. Per guidance from the USEPA, all shrubs will be planted on no more than 15-foot staggered spacing, which will result in the planting of approximately 194 shrubs per acre. Listed in Table 4.2 are species that are suited to wetland conditions, and may be included within the scrub-shrub planting areas.

**Table 4.2 – Proposed Shrub Species**

Common Name	Scientific Name	Indicator Status
Silky Dogwood	<i>Cornus amomum</i>	FACW+
Common Buttonbush	<i>Cephalanthus occidentalis</i>	OBL
Deciduous Holly	<i>Ilex deciduas</i>	FACW
Northern Spicebush	<i>Lindera benzoin</i>	FACW-
Common Elderberry	<i>Sambucus canadensis</i>	FACW-
Rough-Leaf Dogwood	<i>Cornus drummondii</i>	FAC
Black Willow	<i>Salix nigra</i>	OBL

#### **4.6 Restored Riparian Buffer**

As previously described, the riparian buffer along Joachim Creek contains few scattered and light seeded tree species, while the remaining site conditions consist of recent agriculture production. Doe Run is willing to restore and create a forested, riparian buffer by planting the 75-foot setback along the Joachim Creek bankline. A total of 3.36 acres of riparian corridor restoration will be provided. Planting within these locations will consist of mostly tree species, rather than shrub species. Tree densities will be provided using 30-foot staggered spacing (108 trees per acre) and 2- to 3-gallon containerized stock will be planted.

**Table 4.3 – Proposed Tree and Shrub Species for Riparian Area**

Common Name	Scientific Name	Indicator Status
Shingle Oak	<i>Quercus imbricaria</i>	FAC-
Silky Dogwood	<i>Cornus amomum</i>	FACW+
Black Haw	<i>Viburnum prunifolium</i>	FACU
Black Walnut	<i>Juglans nigra</i>	FACU
Bur Oak	<i>Quercus macrocarpa</i>	FAC
Common Persimmon	<i>Disopyros virginiana</i>	FAC
Hackberry	<i>Celtis occidentalis</i>	FAC-
Eastern Redbud	<i>Cercis canadensis</i>	FACU
Rough-Leaf Dogwood	<i>Cornus drummondii</i>	FAC
Gray Dogwood	<i>Cornus racemosa</i>	NI
Sweet Gum	<i>Liquidambar styraciflua</i>	FACW
Shellbark Hickory	<i>Carya laciniosa</i>	FACW
Bitternut Hickory	<i>Carya cordiformis</i>	FAC

Listed in Table 4.4 are habitats provided as mitigation for impacts associated with the Doe Run Slag Storage Area.

**Table 4.4 - Proposed Mitigation Areas**

Habitat	Acreage
Emergent Wetland	12.45
Scrub-Shrub Wetland	6.83
Restored Riparian Buffer	3.36
Areas of Preservation	3.74
Area of Transitional Side Slopes	1.42
<b>Total Area to be Deed Restricted</b>	<b>27.8</b>

## 5.0 AS BUILT REPORT

An "As Built" report will be submitted to the agencies within three months of completing the mitigation project. The report will include the following items as written in a letter provided by the USEPA dated May 3, 2005:

- A description of all Mitigation Plan features completed, including wetland slopes and wetland contours less than 12 inches;
- Deviations from the approved Mitigation Plan;

- Cross-sectional diagrams;
- Planting locations and types;
- Elevations associated with the constructed wetlands;
- Location of permanently staked photo sites with labeled points;
- Dates that construction was completed;
- Problems encountered or observed during construction; and
- Any corrective action anticipated.

## **6.0 SITE CONSERVATION**

A total of 27.80 acres are proposed to be protected in perpetuity under a Declaration of Covenants and Restrictions by Doe Run, which includes 12.45 acres of constructed emergent wetlands, 6.83 acres of constructed scrub-shrub wetlands, 3.36 acres of riparian restoration, and 3.74 acres of preservation (see Figure 6). The 27.80 acres of deed restriction does not include the AT&T utility easement or the 50-foot setback from Union Pacific Railroad Easement. There shall be no removal or destruction of trees or plants, mowing, filling, draining, plowing, mining, removal of topsoil, sand, rock, gravel, minerals, or other materials within the subject site, except as necessary for completion of the mitigation plan. The Declaration of Covenants and Restrictions will preserve the wetland in perpetuity and restrict conflicting uses such as all-terrain-vehicle usage, with the exception of monitoring and maintenance purposes. The restrictions will be recorded with the Jefferson County Recorder of Deeds to protect the area from future development and disturbance. Doe Run will utilize the sample Declaration of Covenants and Restrictions as provided by the USEPA to record with Jefferson county. Doe Run will provide the USEPA, HWP, WPCP, and the CE with a copy of the recorded Declaration of Covenants and Restrictions, including the date, book, and page number of the recording with Jefferson County. The Declaration of Covenants and Restrictions for the project site will preserve the area for aquatic habitat and wildlife purposes.

## **7.0 MAINTENANCE AND MONITORING**

Mitigation observation studies will be conducted annually, for a period of five years following final grading and planting of the mitigation sites. Fixed monitoring locations will be established within each designated habitat which includes: emergent wetlands, scrub-shrub wetland, and enhanced riparian corridor, and upland hill. Stakes will be installed to identify monitoring locations. Photos of the monitoring locations will be provided with the same approximate vantage point annually, and maps shall

be provided where the monitoring photographs were taken. Photographs will be labeled with the date of the photograph, direction of view and location, and a brief description of the photograph.

Site visits for wetland monitoring will be conducted during the growing season, prior to September 1st of each year. The monitoring report shall include a list of parties responsible for the annual monitoring activities. The data collected in each yearly study will be detailed in a formal report, including photographs and suggestions or plans to improve or repair any deficiencies that may exist. Data collected will be quantified and presented, which will include the following measurements: overall percent vegetative cover using Daubenmire cover Class Method (per USEPA), percent species survivorship in wetlands, riparian buffer, and uplands, and composition of hydrophytic species for each stratum, and percent nuisance/exotic cover. Annual monitoring will include extensive cruising of the mitigation site to identify any development of nuisance/exotic species. Cruising will be conducted via transect method, with transects spaced approximately 200 feet apart. The annual report will be submitted to the CE, USEPA, and HWP by January 31<sup>st</sup> following each monitoring year. It is then the responsibility of these agencies to advise Doe Run on suggested plans for improvement, if necessary. The observation reports as well as any corrective measures are the responsibility of Doe Run.

#### **7.1 Performance Criteria**

The following performance criteria will be reviewed as success measures during the annual observation studies. Tree and shrub survivability of planted species must equal or exceed 80 percent, and tree and shrub species composition shall equal or exceed 5 species. Herbaceous vegetation coverage will equal or exceed 75 percent of the ground surface coverage, and herbaceous species composition shall equal or exceed 15 species. Overall, hydrophytic species composition should meet or exceed 50 percent with the established wetland areas. Invasive, exotic, and nuisance species are not to exceed more than 10 percent coverage of the mitigation area which includes, but not limited to the following species: common hop-vine (*Humulus lupulus*), purple loosestrife (*Lythrum salicaria*), and reed canary grass (*Phalaris arundinacea*). Additionally, to prevent the development of a monoculture of cattail (*Typha latifolia* and *Typha angustifolia*), aerial coverage of this species should be limited to approximately 25 percent. Per the requests of the USEPA, tree guards will be closely monitored for small mammal nesting materials to prevent tree girdling and aid with tree survivability.

Hydrologic and soil conditions will be investigated, and any deficiencies or problems identified. Hydrologic and soil conditions will be subject to the same parameters as established in the CE's 1987 Wetland Delineation Manual (CE Manual). Evidence of achieving wetland soils and hydrology is

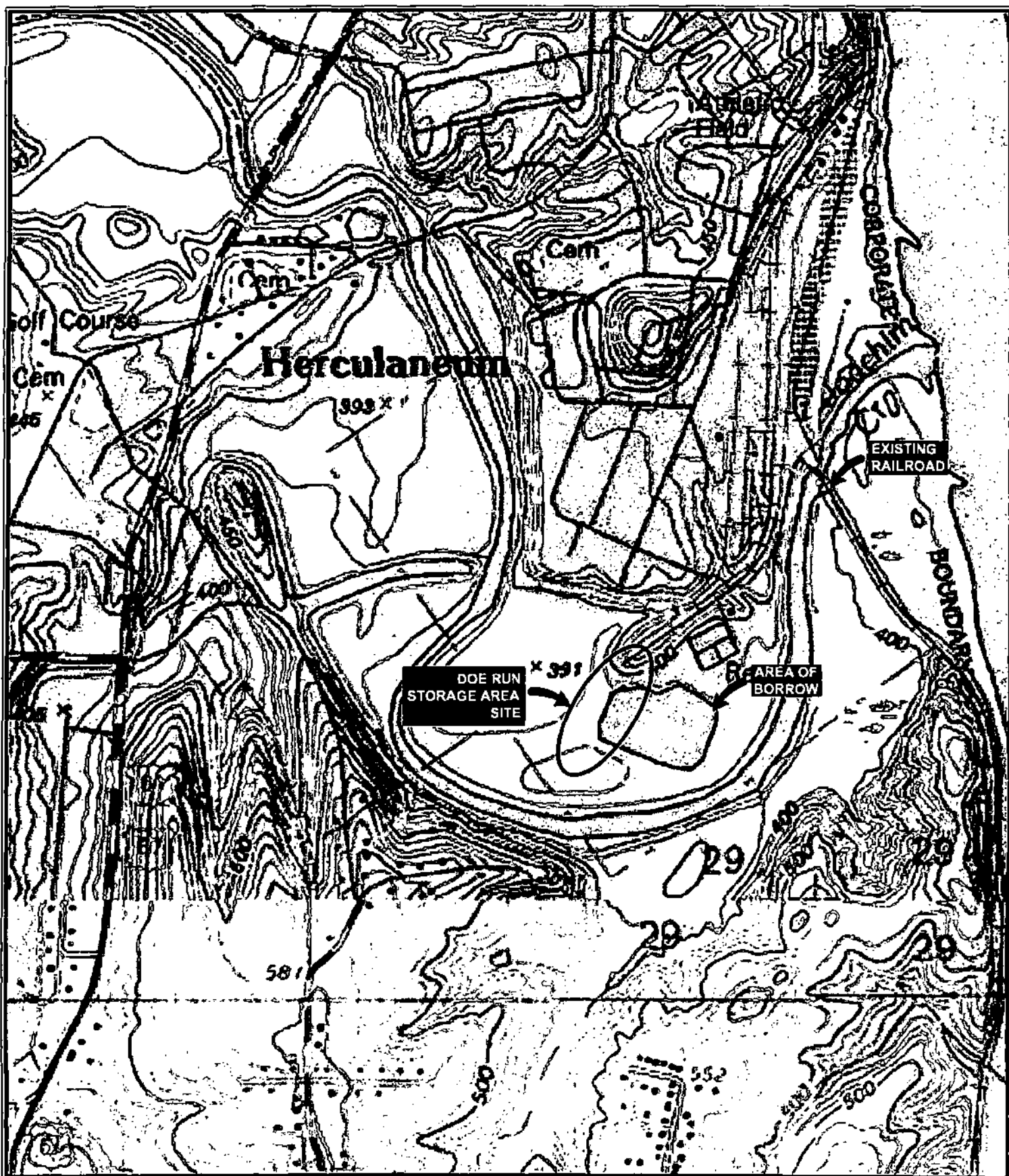
based upon observable features. Hydrology is often measured through the presence of primary and/or secondary hydrologic indicators, such as standing water, saturated soil, drift lines, and water-marks on adjacent trees. Soil colors can also indicate hydrologic conditions on the site. Mottling and low chroma matrix colors are indicators of a site with an active water regime. However, these characteristics develop at varying rates. Therefore, the use of soil colors will not be heavily relied upon when determining the establishment or success of the constructed wetlands. However, Doe Run recognizes that added emphasis will be put on identifying hydric soils characteristics in the event primary and/or secondary hydrologic features are not observed at the time of monitoring.

The standards of regulated wetlands (i.e., wetland hydrology, wetland soils characteristics, and wetland vegetation), as detailed within the 1987 CE Manual, will also be considered and treated as the performance criteria for the created wetland areas. Monitoring will be provided annually, for a minimum of five years. If after five years, the mitigation areas have met the regulated characteristics of wetlands, as identified in the standards of the CE Manual, monitoring will no longer be necessary. If performance criteria are not met after five years, Doe Run will submit a plan providing corrective measures to address any remaining concerns, as well as a schedule for any additional work and achievement to meet the standards established in the CE Manual. Plans for any corrective measures shall be approved by the USEPA and MDNR, prior to incorporating measures in the field.

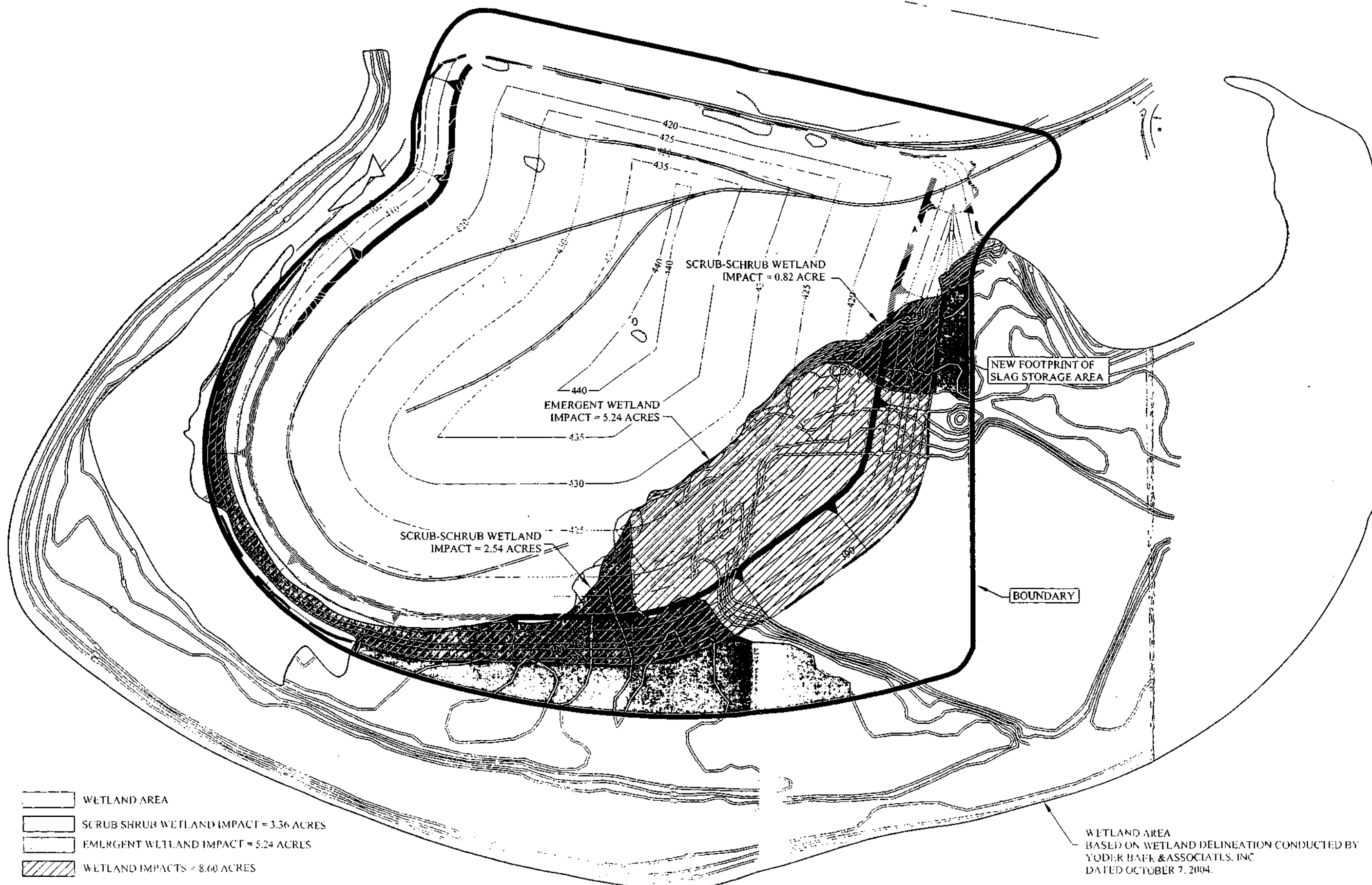
## **8.0 LIMITATIONS**

This report has been prepared for the exclusive use of the Doe Run Company. SCI is not responsible for independent conclusions or recommendations made by others. The quantification of the proposed mitigation acreage at the Festus site was determined by SCI through surveys that were prepared by Govero Land Services. The quantification of wetland impacts at the Doe Run facility in Herculaneum were based upon survey provided by Effan Survey Company, development plans prepared by Barr Engineering, and wetland delineation prepared by Yoder Baer. SCI is not responsible for surveys, calculations, or plans that were prepared by others. Furthermore, written consent must be provided by SCI should anyone other than our clients and its lender (if applicable) wish to excerpt, or rely on, the contents of this report. Additionally, SCI in no way guarantees the successful establishment of the aforementioned mitigation areas. The plan is based on practices commonly performed and accepted. Various unforeseen factors can lead to the failure of a mitigation area.





	<b>PROJECT NAME</b> DOE RUN STORAGE AREA MITIGATION FESTUS, MISSOURI			<b>General Notes/Legend</b> USGS TOPOGRAPHIC MAP HERCULANEUM, MISSOURI QUADRANGLE DATED 1993 10' CONTOURS SELMA, MISSOURI QUADRANGLE DATED 1993 20' CONTOURS	
	<b>VICINITY MAP - HERCULANEUM</b>				
	<b>DRAWN BY</b> LAP <b>CHECKED BY</b> LMF	<b>DATE</b> 06/2006	<b>JOB NUMBER</b> 2004-2077.31		
MICROSOFT STREETS AND TRIPS 2005					<b>SCALE</b> 1" = 1000' <b>FIGURE</b> 1



- WETLAND AREA
- SCRUB SHRUB WETLAND IMPACT = 3.36 ACRES
- EMERGENT WETLAND IMPACT = 5.24 ACRES
- WETLAND IMPACTS = 8.60 ACRES

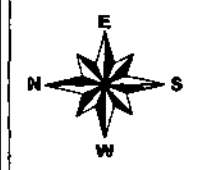


**General Notes/Legend**

BASED ON UNDATED PLAN PROVIDED ELECTRONICALLY ON 1/20/2006 FROM BARR ENGINEERING INC. DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

**PROJECT NAME**  
DOE RUN STORAGE AREA MITIGATION  
FESTUS, MISSOURI

**WETLAND DELINEATION AND  
REVISED DEVELOPMENT PLAN**

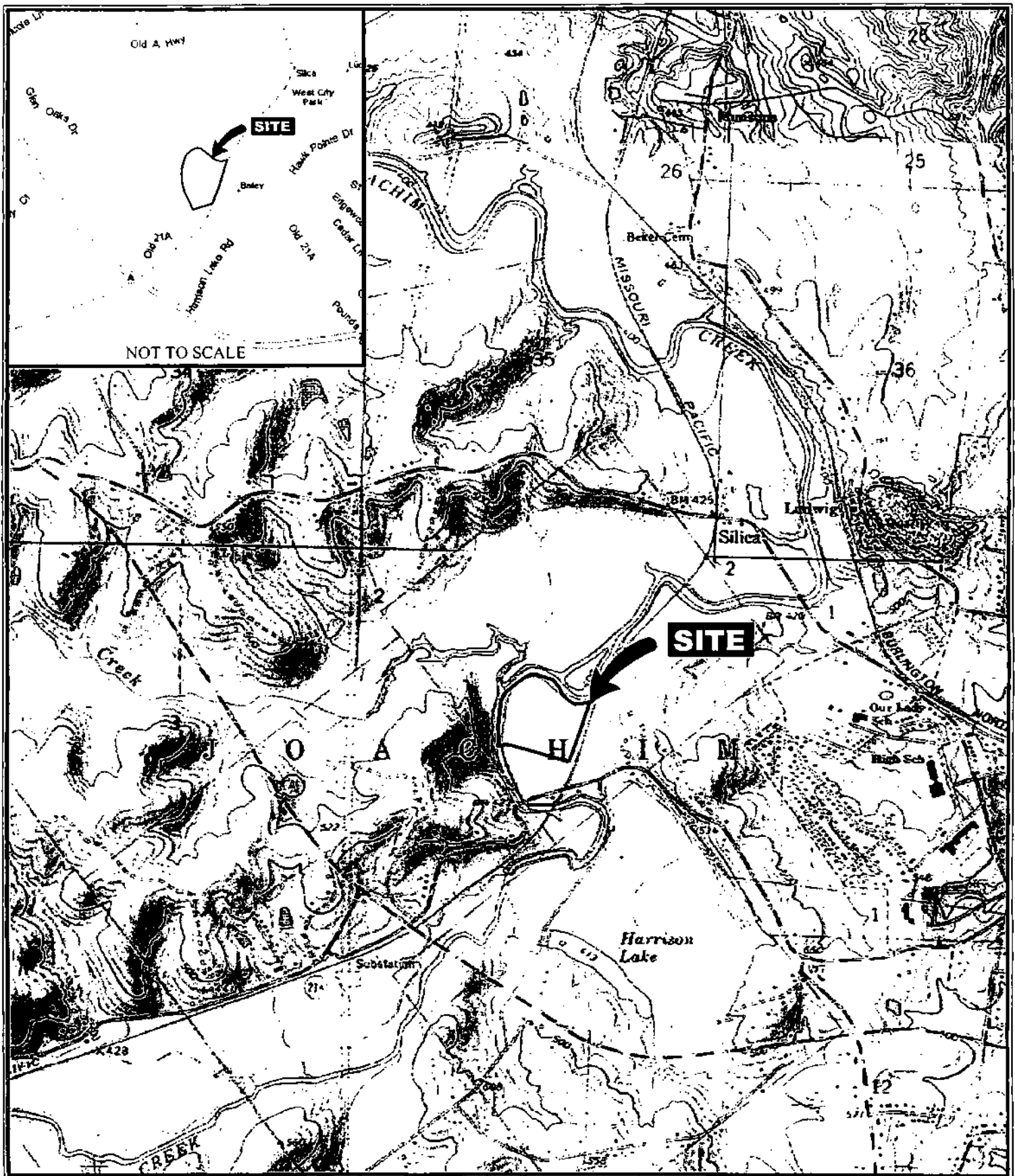


**SCALE**  
1" = 200'

**JOB NUMBER**  
2004-2077.31

**DATE**  
06/2006

**DRAWN BY** LBP  
**CHECKED BY** LMF  
**FIGURE**  
2



PROJECT NAME  
DOE RUN STORAGE AREA MITIGATION  
FESTUS, MISSOURI

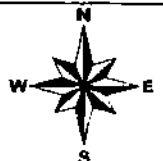
VICINITY AND TOPOGRAPHIC MAP

DRAWN BY	LAP	DATE	JOB NUMBER
CHECKED BY	LMF	06/2006	2004-2077.31

General Notes/Legend

USGS TOPOGRAPHIC MAP  
FESTUS, MISSOURI QUADRANGLE  
DATED 1980  
PHOTO REVISED 1982  
20' CONTOURS

NIK ROSS/STREETS AND TRIPS 2005



SCALE 1" = 2000'

FIGURE 3



FIGURE 4



**General Notes/Legend**

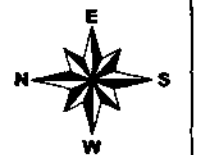
INDICATES APPROXIMATE SOIL BORING LOCATIONS

BASED ON UNDATED PLAN PROVIDED ELECTRONICALLY ON 10/18/2004 FROM GOVERO LAND SERVICES. DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

**PROJECT NAME**

DOE RUN STORAGE AREA MITIGATION  
FESTUS, MISSOURI

**REVISED MITIGATION PLAN**



**SCALE**

1" = 200'

**JOB NUMBER**

2004-2077.31

**DATE**

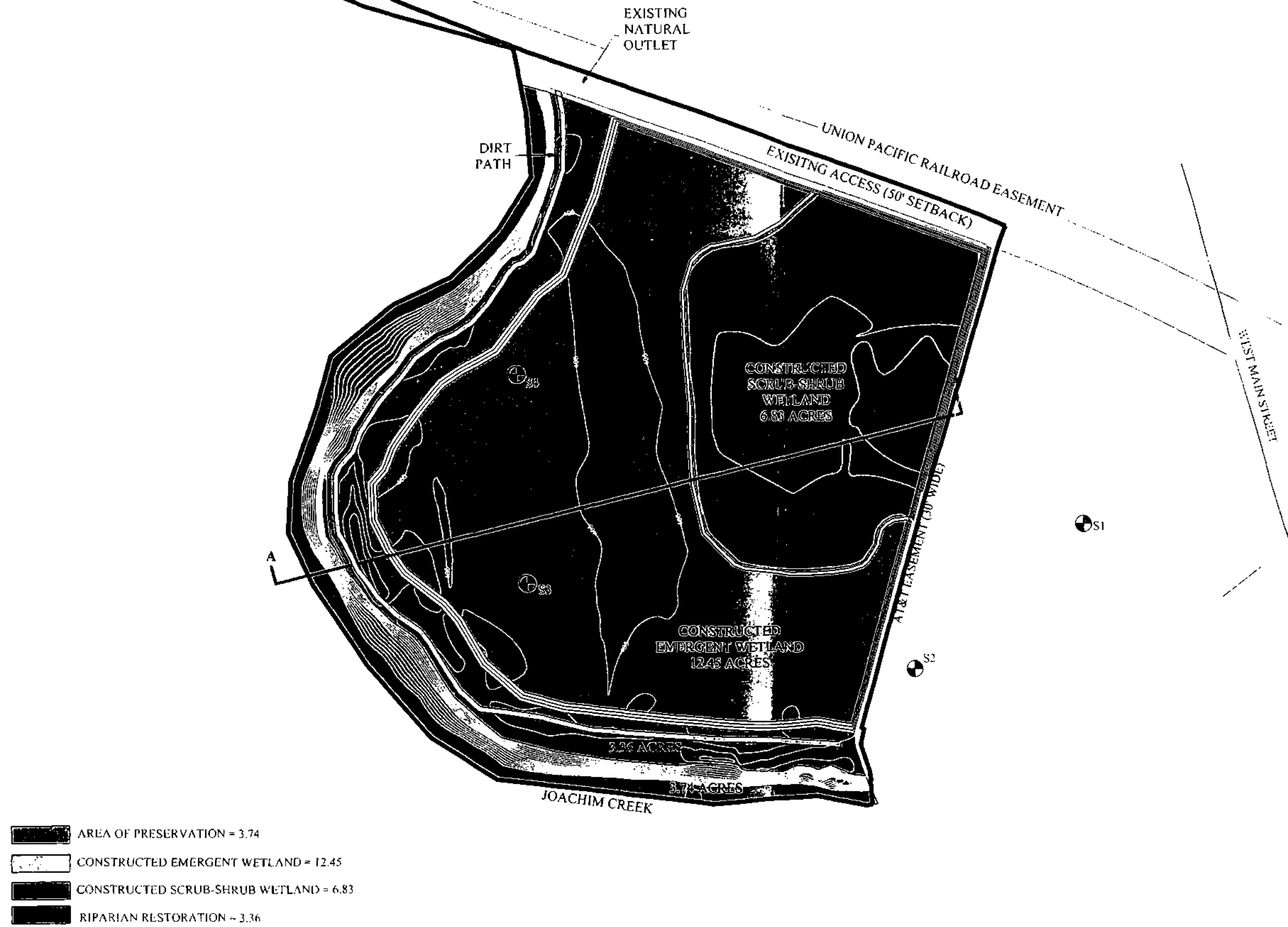
06/2006

**DRAWN BY** LAP

**CHECKED BY** LMF

**FIGURE**

5







General Notes/Legend

BASED ON UNDATED PLAN PROVIDED ELECTRONICALLY ON 10/18/2004 FROM GOWEN  
LAND SERVICES. DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY  
VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR  
WHICH IT WAS GENERATED.

PROJECT NAME

DOE RUN STORAGE AREA MITIGATION  
FESTUS, MISSOURI

AREAS TO BE DEED RESTRICTED



SCALE  
1" = 200'

JOB NUMBER  
2004-2077.31

DATE  
06/2006

DRAWN BY L.A.P.

CHECKED BY L.M.F.

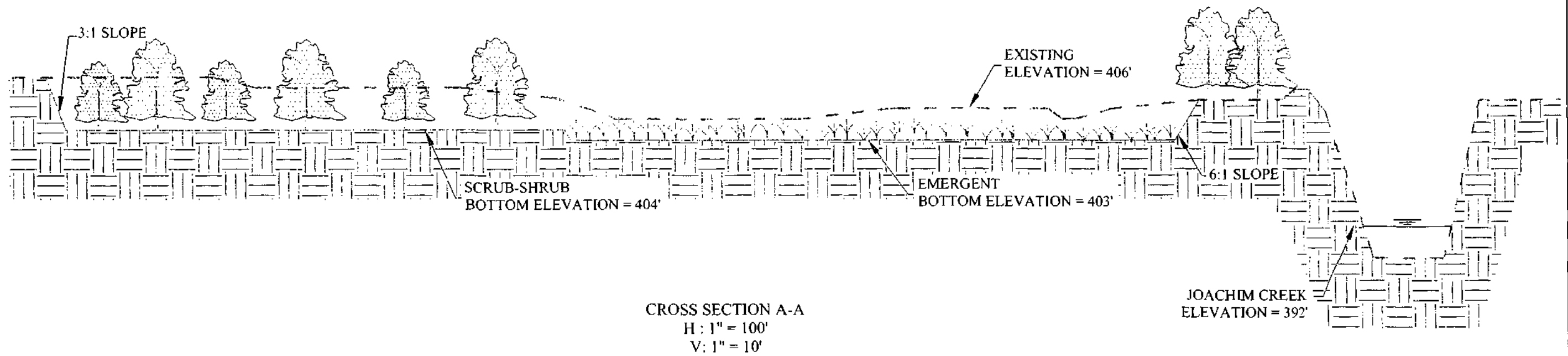
FIGURE

6



General Notes/Legend

DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.



PROJECT NAME

DOE RUN STORAGE AREA MITIGATION  
FESTUS, MISSOURI

CONCEPTUAL CROSS SECTION



SCALE  
1" = 100'

JOB NUMBER  
2004-2077.31

DATE  
06/2006

DRAWN BY LAF

CHECKED BY LMF

FIGURE  
7